

## **REMARKS**

Applicant is in receipt of the Office Action mailed March 16, 2004. Claims 1, 10, and 20 have been amended. Claims 2, 11, and 21 have been cancelled. New claims 29-73 have been added. Thus, claims 1, 3-10, 12-20, and 22-73 remain pending in the case. Further consideration of the present case is earnestly requested in light of the following remarks. As noted above, a Request for Continued Examination is included herewith.

### **Section 102 Rejections**

Claims 1, 3-10, 12-20, and 22-28 were rejected under 35 U.S.C. 102(b) as being anticipated by Browning et al. (US Patent 6,590,366, "Browning"). However, the Office Action indicated that dependent claims 2, 11, and 21 include allowable subject matter, and so claims 1, 10, and 20 have been amended to include the limitations of claims 2, 11, and 21, respectively. Applicant has further amended claims 1, 10, and 20 to clarify the claimed invention. Applicant believes that claims 1, 3-10, 12-20, and 22-28 as written are allowable, and respectfully requests removal of the 102 rejection of these claims.

Applicant submits that new claims 29-73 are also allowable over the cited art.

New claim 29 recites:

29. (New) A system for controlling motion of an object, the system comprising:  
a motion device which is operable to move the object;

a motion control system which is coupled to the motion device, wherein the motion control system includes a processor and a memory medium, wherein the memory medium stores a motion control software program, wherein the motion control software program is executable by the processor to:

determine a placement of one or more pulses for each of at least a subset of a plurality of time intervals, wherein two or more of the at least a subset of the plurality of time intervals have differing quantities of pulses, wherein each time interval that includes one or more pulses includes a first pulse and a last pulse, and wherein a deadband between the start of the last pulse in the time interval and the end of the time interval is no larger than

a largest pulse period in the time interval; and

generate the pulses across the time intervals according to the determined placement to drive the motion device to move the object in a substantially smooth manner.

Applicant submits that Browning fails to teach the features and limitations of claim 29. For example, as described in the Abstract, Browning discloses a stand-alone, wide-bandwidth control system for electromechanical arrangements having open-loop instability, e.g., negative stiffness, without the drawbacks of inadequate compensation, cross-coupling sensitivity, and lack of resonance control. More specifically, as also described in the Abstract and in the Summary, col. 3, lines 32-67, the control unit includes a specially designed compensation filter, which isolates the open-loop instability, and is described by Browning in a preferred embodiment as particularly useful for controlling the stiffness of magnetic bearings used to suspend or levitate a movable member, such as a rotating shaft.

As also described in Browning, Figure 9 illustrates graphs of measured closed loop (dotted) and derived open loop (solid) transfer function amplitudes that are used to construct the compensator for implementing the invention, Figure 10 illustrates graphs of measured closed loop (dotted) and derived open loop (solid) transfer function phases that are used to construct the compensator for implementing the invention, Figure 11 is a block diagram illustrating how a compensation filter according to the present invention is designed to isolate negative stiffness in the plant, Figure 12 illustrates graphs showing measurements of a plant with negative stiffness included, Figure 13 illustrates graphs showing measurements of the plant without negative stiffness, Figure 14 compares amplitude measurements on a single bearing with (dotted) and without (solid) Browning's system in use, Figure 15 compares amplitude measurements between two bearings with (dotted) and without (solid) Browning's system in use, Figure 16 illustrates low amplitude measurements between perpendicular directions on a single bearing without Browning's system in use, Figure 17 shows graphs illustrating the filter fit for a control system according to Browning's invention, Figure 22 shows graphs illustrating higher gains achieved through the use of Browning's system in a magnetic bearing system, and Figure 23 shows graphs illustrating better disturbance rejection achieved through the use of Browning's system in a magnetic

bearing system.

Applicant respectfully submits that nowhere does Brown teach or suggest Applicant's invention as represented in claim 29. More specifically, nowhere does Browning teach or suggest determining a placement of one or more pulses for each of at least a subset of a plurality of time intervals, wherein two or more of the at least a subset of the plurality of time intervals have differing quantities of pulses, wherein each time interval that includes one or more pulses includes a first pulse and a last pulse, and wherein a deadband between the start of the last pulse in the time interval and the end of the time interval is no larger than a largest pulse period in the time interval. Rather, Browning discloses a system for controlling an electromagnetic member, where a compensation filter is used to isolate negative stiffness characteristics, and specifically does not teach this feature of claim 29.

For at least the reasons given above, Applicant respectfully submits that claim 29, and claims dependent thereon, are patentably distinct over Browning, and thus are allowable. Applicant further submits that since independent claims 43 and 57 also include this limitation, claims 43 and 57, and claims respectively dependent thereon, are similarly patentably distinct over Browning, and are thus allowable, as well.

Applicant further submits that new claim 71 is also allowable over Browning.

New claim 71 recites:

71. (New) A system for controlling motion of an object, the system comprising:  
a motion device which is operable to move the object;

a motion control system which is coupled to the motion device, wherein the motion control system includes a processor and a memory medium, wherein the memory medium stores a motion control software program, wherein the motion control software program is executable by the processor to:

determine a desired overall average step pulse period for a plurality of time intervals, wherein the desired overall average step pulse period is a non-integer number of clock cycles;

determine a desired average step pulse period for each of the plurality of

time intervals, wherein at least a subset of the desired average step pulse periods have a non-integer number of clock cycles;

for each interval of the plurality of intervals, perform one or more of:

determine one or more actual step pulse periods, each having an integer number of clock cycles; and

modify the interval;

wherein the one or more actual step pulse periods and/or the modified intervals for the plurality of intervals approximate the desired overall average step pulse period over the plurality of time intervals;

determine a placement of pulses for each of the plurality of time intervals based on one or more of:

the determined one or more actual step pulse intervals; and

the modified intervals; and

generate the pulses across the plurality of time intervals according to the determined placement to drive the motion device to move the object in a substantially smooth manner.

Applicant submits that Browning, whose system is characterized above, fails to teach or suggest the features and limitations of claim 71. For example, nowhere does Browning teach or suggest determining a desired overall average step pulse period for a plurality of time intervals, where the desired overall average step pulse period is a non-integer number of clock cycles, nor determining a desired average step pulse period for each of the plurality of time intervals, where at least a subset of the desired average step pulse periods have a non-integer number of clock cycles. Nor does Browning teach or suggest for each interval of the plurality of intervals, determining one or more actual step pulse periods, each having an integer number of clock cycles, and/or modifying the interval, where the one or more actual step pulse periods and/or the modified intervals for the plurality of intervals approximate the desired overall average step pulse period over the plurality of time intervals. Finally, Browning further fails to teach or suggest determining a placement of pulses for each of the plurality of time intervals based on the determined one or more actual step pulse intervals, and/or the modified intervals.

Thus, Applicant respectfully submits that claim 71 is allowable over Browning. New independent claims 72 and 73 include similar limitations as claim 71, and so Applicant submits that these claims are similarly allowable for at least the reasons provided above.

Applicant also asserts that numerous ones of the dependent claims recited further distinctions over the cited art. However, since the independent claims have been shown to be patentably distinct, a further discussion of the dependent claims is not necessary at this time.

## CONCLUSION

In light of the foregoing amendments and remarks, Applicant submits the application is now in condition for allowance, and an early notice to that effect is requested.

If any extensions of time (under 37 C.F.R. § 1.136) are necessary to prevent the above referenced application(s) from becoming abandoned, Applicant(s) hereby petition for such extensions. If any fees are due, the Commissioner is authorized to charge said fees to Meyertons, Hood, Kivlin, Kowert & Goetzel PC Deposit Account No. 50-1505/5150-53800/JCH.

Also enclosed herewith are the following items:

- ☒ Return Receipt Postcard
- ☒ Request for Continued Examination

Respectfully submitted,



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